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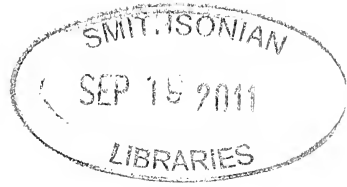
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Cover: Not Florida's Big Cypress Swamp or Georgia's Okefenokee, but the Spanish-moss-hung exhibit that houses the American alligators in the Reptile House at NZP. This is one of many environmental cages in the building. Some of the newer ones are the rain forest exhibit illustrating iguana communications; the Eastern United States deciduous woodland scene inhabited by the wood turtle, box turtle, pilot black snake, and corn snake; and the pine-forest floor habitat of the Florida gopher tortoise. If the outdoor Zoo becomes too cold for you in the winter months, you can see these and other reptiles and amphibians in realistically recreated settings in the warmth of the Reptile House, while the wild herpetozoans of this part of the world are hibernating in nature around you.

The Revised Master Plan for NZP

Theodore H. Reed, Director

National Zoological Park



The new preliminary master plan for the National Zoological Park has been approved by both the Commission on Fine Arts (CFA) and the National Capital Planning Commission (NCPC). The plan emphasizes the needs of the animals and the aesthetic appeal of good landscaping and relegates architecture to a supportive role. Although much complicated design work remains to be done, the architects—Faulkner, Fryer, and Vanderpool and Lester Collins, the landscape architect—with the continuing cooperation of the NZP staff, expect to present the final plans to CFA and NCPC in March or April. Once the final approved plans are in hand, it is conceivable that construction could start in fiscal 1973, and that important segments of the “new zoo” will be visible by the bicentennial year of 1976.

NZP is fortunate in being located on 165 rolling acres of Rock Creek Park, which will enable the exhibits to be displayed at varying heights. One major alteration will be the removal of the existing parking lots, some of which are adjacent to the present water-fowl ponds, which will add 12 acres of valuable animal-exhibit area. Terraced and landscaped parking facilities, two-thirds underground, will be constructed north-east of the main road through NZP—an area largely unsuitable for animal exhibits. The existing Lion House, the animal facility most urgently in need of replacement, will be removed, and a new area, to be known as Lion Hill, will be developed.

Lion Hill will provide large landscaped and moated areas for the lions and Bengal Tigers (white and yellow). New waterfowl ponds will be developed at the site of the existing ones, and a Gibbon Island will be constructed within the new pond complex. Flanking the waterfowl ponds will be generous cages for the lesser cats, and through the ingenious use of varying ground levels, these enclosures will meet the

Since Hagenbeck's work at Hamburg (1910–1920), many new and interesting concepts for animal exhibition have been developed by zoos around the world. The most imaginative of these concepts . . . is to increase the apparent sense of freedom of the animals and to eliminate visual barriers for the public. This approach to zoo design is responsive to international public interest in a more sensitive environment for animals. It also creates a totally new relationship between man and nature. The increase in tension and dialogue between animal and visitor is the basis for a dramatic and new zoo design philosophy.

Master Plan for the National Zoological Park, Preliminary Report to the Smithsonian Institution, June 1971.

needs of arboreal cats by giving them trees to climb; modern climate control methods will be used to meet the climatic requirements of various species of cats and other animals.

On Bird House Hill, in addition to the existing outdoor and indoor flight cages, there will be many additional outdoor cage clusters and an extensive vine-covered pergola that will offer wide vistas over the extensive valley that leads to Rock Creek. Roaming the valley to the south will be okapi, bongo, moose, and deer, in conditions approximating as closely as possible those they would have in their native habitats. On the southeast slope from Cathedral Avenue, goats and sheep will have similar habitats and will be visible from a planned overlook on the crown of Bird House Hill. The rocky wooded hillside now devoted to canines will be turned over to the bears and foxes, which will have both indoor and outdoor space; the outdoor space for the bears will be on various levels and will resemble the animals' natural terrain as far as possible. The polar bears will be located on the point of land adjacent to Blue Road Bridge over Rock Creek, opposite the existing canine exhibits. Thus the bear exhibits will remain in close proximity to one another. Most of the monkeys will be located at the present site of the bear cages, and they too will be shown both indoors and out.

Many of the existing buildings will be remodelled—the Elephant, Small Mammal, Reptile, and Monkey Houses—and some of them put to different or more varied uses. A monkey island, mainly for the Barbary Apes (*Macaca sylvanus*), is to be constructed in the area now occupied by the Puma House. Every opportunity will be taken to develop additional veldt exhibits at three different locations, notably on the site of the present parking lots. Each area will combine hoofstock with other compatible animals and birds.

Nor are the needs of visitors being overlooked. All the walks will be broadened to accommodate both pedestrians and the FONZ trackless trains; the kiosks will be strategically placed to dispense food, information, and souvenirs as well as tickets. The entire zoo is to be re-landscaped and will contain flowering trees, bamboo, specimen and ornamental trees in special locations, flowerbeds along paths, and carefully chosen outdoor furniture—benches, shelters, drinking fountains, telephone booths, guard-rails, and educational and informational

signs. The old clock and the familiar statuary will be retained. The perimeter fence will be screened by arrow bamboo. In his landscaping, Mr. Collins is seeking to give NZP the character of an informal American urban park, with an air of studied negligence within an ordered design.

Holt House, the 166-year old house now being used as the administration building, is also to be retained and will be renovated as a center for visiting scholars. A new building complex at the Connecticut Avenue entrance will include administrative and FONZ offices, a theater for showing slides and movies and for presenting FONZ and other lectures; a FONZ gift-shop; and a cafeteria and a more formal restaurant. Support facilities such as supply, commissary, and the police quarters will be as inconspicuous as possible.

Neighborhood citizen groups reviewed these fresh preliminary plans and praised the overall design. The handling of automobiles, buses, and parking, however, caused concern. As suggested by the NCPC, NZP will engage traffic consultants to study the parking and traffic problems and to make recommendations that will be incorporated into the final design. ■

Lecture Announcement

Richard E. Leakey, the director of the National Museums of Kenya at Nairobi, will present an illustrated lecture on his work at Lake Rudolph, Kenya, where he is seeking new evidence of the antiquity of man, under a grant from the National Geographic Society. Lake Rudolph is almost exactly due north of Nairobi and extends to the border of Ethiopia.

The lecture will take place on Saturday, February 19, at George Washington's Lisner Auditorium, 21st and H Streets, N.W. at 8 p.m. Tickets are now available from the office of Friends of the National Zoo. The price for non-members is \$5 each; members of FONZ pay \$3.

As part of a special membership drive, however, anyone who becomes a member of FONZ between now and February 15 will be given one free ticket to the lecture if he becomes a student or regular member and two if he buys a family membership. If you know someone who would like to become a member and take advantage of this offer, use the coupon on the back cover or call 232-4555.



The African white-necked rock-fowl (*Picathartes gymnocephalus*) in the tropical flight-room.

The Bird House has become a breeding center for the rare African white-necked rock-fowl (*Picathartes gymnocephalus*), and in cooperation with the Los Angeles Zoo, Busch Gardens in Tampa, Florida, and the Baltimore Zoo, the NZP population has been increased to six. It is hoped that the indoor tropical flight room, where the *Picathartes* have established themselves, will approximate their natural environment in the wet forested highlands of Sierra Leone. These birds are colonial nesters and reportedly plaster their mud nests, lined with plant fibres and a few feathers, to the faces of cliffs; the cliffs in the tropical flight room are expected to provide an excellent building site.

Often misleadingly called "bald-headed crow" or "yellow-headed crow," *Picathartes gymnocephalus* does not belong to the crow family but to the *Timaliidae*, a very numerous family of Old World forest birds which also includes the silver-eared mesia in cage 5, to the left of the main door of the Bird House. The species name, *gymnocephalus*, which means "bare-headed," and the epithet "bald-headed" are

given to the white-necked rock-fowl with good reason. Contrasting with its black back and white underside and neck are patches of almost completely featherless yellow skin around the eyes and equally bare black spots on each side of the head.

These inquisitive birds fly seldom and usually hop about the ground while feeding. In the wild they are said to eat a great variety of insects, crustaceans, worms, and small amphibians; in the tropical flight room their favorite diet seems to be nightcrawlers. ■

Smokey Bear, known to Americans for 21 years as the symbol of forest fire prevention, has acquired an heir—Little Smokey. The new male Black Bear (*Ursus Americanus*) has a chocolate-brown coat; other members of his species may be black, light brown, cinnamon brown, or even white, although that particular color phase is extremely rare.

Today Little Smokey is slightly more than a



Little Smokey, a chocolate-brown Black Bear, is heir-apparent to Smokey as the symbol of forest fire prevention.

year old and weighs about one hundred pounds. He was discovered last May in the Lincoln National Forest in Southeastern New Mexico, when he was a scrawny, forty-pound orphan, stealing food put out for other animals. It is not known why his mother abandoned him; although Little Smokey came from the same area as his predecessor, he was not, like Smokey Senior, involved in a fire.

At any rate, District Wildlife Supervisor Roy Owens eventually captured the small thief, and Smokey Junior was transported to the Ghost Ranch Museum near Abiquiu, where the Forest Service maintains conservation exhibits and a small zoo. On November 15, Little Smokey was presented to the nation by the New Mexico Department of Game and Fish, and NZP was named by the Department of Agriculture as his permanent guardian.

Little Smokey occupies the cage next to Smokey Senior and his female companion, Goldie, who was brought to the zoo in 1962, in the hope that the pair would produce a natural heir. ■

On December 27, Jennie, NZP's only adult female orangutan, gave birth to twin daughters. These are her fourth and fifth offspring since she arrived at NZP as an adolescent in 1953. Although twin births may not be any rarer for orangutans than they are for humans, only

two other multiple births in captivity have been reported, one in Seattle and one in Munich.

Orangutans are an endangered species, and a major reason for their steady decline in numbers over the past hundred years has been the activity of collectors, for the pet trade, zoos, and circuses. Usually a mother orangutan with young was killed and the young captured. Now their capture is prohibited in their native territories on Sumatra and Borneo, but the trade still continues illegally. NZP and other zoos have been interested in breeding orangutans in captivity in order to provide a continuing supply for their exhibits without further raiding the wild populations. ■

In November the fences separating the gnu and zebra compounds were removed, and the two groups of animals were allowed to share the area and intermingle, much as they do on grazing grounds and around waterholes in Southeast Africa. Later the Cape Buffalo compound was connected with the enlarged compound by a passageway; and recently a pair of ostriches have been given the run of the area, adding further to the diversity and authenticity of this savannah scene. ■

The Rothchild's mynahs, the busy, white starling-like birds with a blue eye mark, on display in the indoor flight cage, have laid three more eggs. Last season the NZP population of these mynahs reached 23, a cause for ornithological satisfaction, since the birds, whose native land is Bali, are on the endangered list. However, they seem to breed freely in captivity and several other zoos report similar success. But the real test of their viability will be whether a second generation will breed in captivity. ■

The sign on cage 51, close to the Bird-House train-stop, said Broad-Winged Hawk, but the cage is empty now, and there are no more of these hawks in NZP. The last two were released in Western Maryland last August, by Keeper Len Jones. Mr. Jones has made birds of prey his specialty, and he carefully conditioned the hawks before he released them to make sure they would be able to procure food and defend themselves in the wild. NZP hopes to release other birds from time to time. ■

Unnoticed Denizens of the Southwest

Jaren Horsley,

Curator of the Division of Reptiles,
National Zoological Park

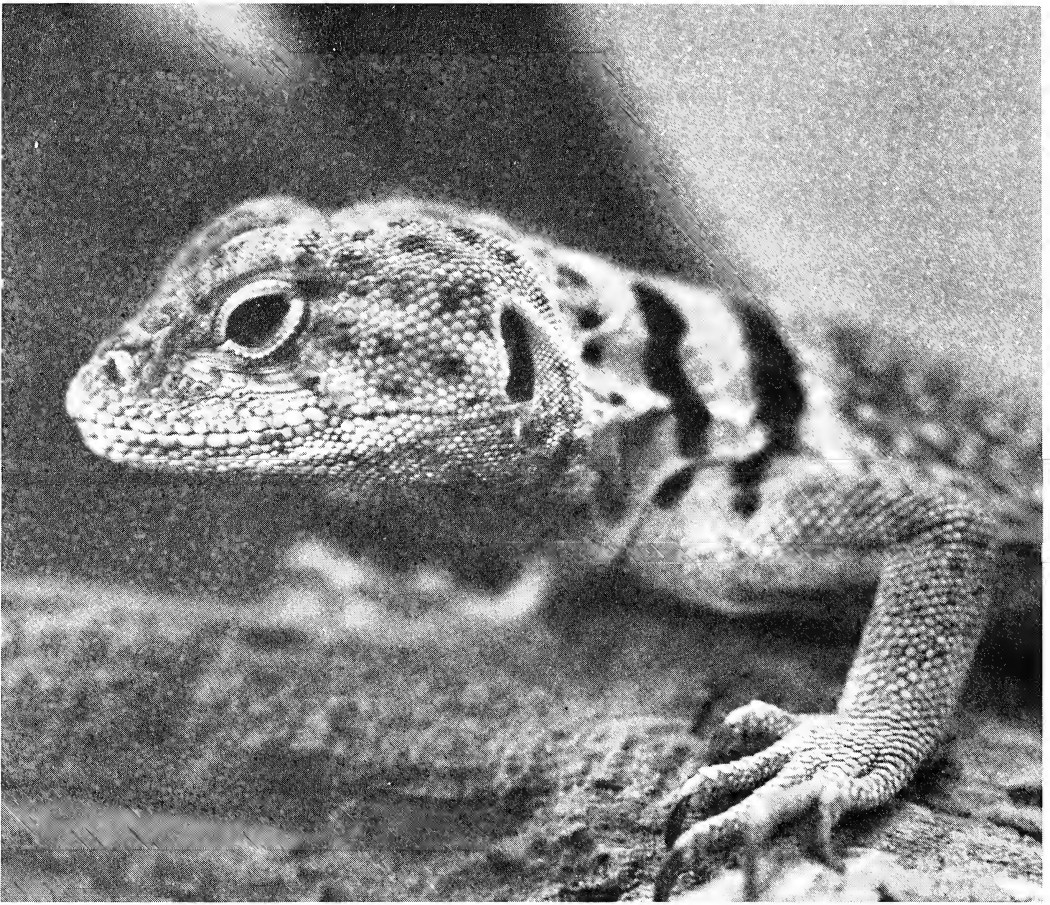
The lizard crawls slowly out to the edge of the dead tree limb. All he can see in any direction are rolling limestone hills, mesquite, and dead trees. In his single year of life this lizard has only known this bleak but beautiful West Texas landscape—the eroded arroyos of the Edwards Plateau where only animals of great durability can make a life for themselves.

From the lizard's hillside home of brush and fallen scrub, the only living thing to be seen is a Hereford steer trying to find a morning meal among the short, sparse grasses. Later in the day that same steer will be seeking shade to protect it from the devastating early summer sun. Shade is no easy thing to find in this country, and the only cool spots are in the stream-cut bottoms of the arroyos where years of water-wear have left a cliff or bank to shield away the sun's rays. To most men this is lonely and depressing country, far from the comforts of treated water and air-conditioning. To a few unusual people and to the tree lizard

(*Urosaurus ornatus*) this open, nearly treeless country is home.

To the lizard the pile of dead leaves is his feeding ground. Here the leaf hoppers are abundant, and the soft-bodied insects will keep him going until November, when the cold weather will force him to seek winter refuge in the heaps of half-rotten bark deep within the pile of decaying limbs and branches. Today, however, like many days this spring, he has different reasons for using this patch of countryside. Inside his tiny, three-inch body a hormonal change has taken place, forcing him to become sensitive to signs around him that he hasn't noticed before.

He has started to act a little differently. On this particular day, while perched on the tree branch, he has begun to raise his body off the wood and stand as high in the air as his legs will allow. Then he flattens his body so that the bright turquoise patches on his white belly can be seen from the side. He lowers his throat and exposes the yellow and green circle



This year-old female collared lizard shows the black and white collar characteristic of the species.

on his dewlap. In contrast to the lizard's dark brown back, these areas appear extremely colorful, and exposing them makes him look twice his normal size.

Suddenly he bends his knees and quickly lowers and raises his body four or five times. After finishing this push-up movement, which lasts about five seconds, he relaxes and lies back down on the tree limb to bask in the pre-noon sun. He has made this movement before but never with the same intensity as he has during the past few weeks.

A few days earlier another male much like himself was basking on a tree limb that connected his brush pile with our lizard's brush pile. When they saw one another, both lizards dashed toward each other with quick, shuffling steps. When he was close to the other male, our lizard again flattened his sides, raised his body, and began to make his push-up movements with great intensity. He then dashed at

the intruder, who promptly retreated to the depths of a dead bush. Our lizard turned toward the invader and showed all his color and postures. This sideways approach apparently caused the other male to retreat, so there was no need for the defending lizard to bite him.

Today, he quietly continues feeding until the sun, straight up in the sky, makes it too hot for him to continue. Then he crawls down into a shady hollow in one of the logs, where the cool, moist air keeps him comfortable. Later in the afternoon he will return to the upper reaches of the pile to feed and display again.

In the late afternoon, as he lies on top of the pile trying to absorb enough of the sun's energy to raise his body temperature to his preferred level, a familiar form moves into his field of vision. Is it that neighboring male again, come to feed on the choice little spiders that live in the leafy debris on the ground?

Our lizard runs quickly down the limb to a point near the ground where he can get a better look at what is entering his activity range.

The newcomer is a lizard all right, but not the male he has seen earlier. It looks like the male, but it is slightly smaller. Our lizard runs to within a few inches and raises and lowers his colorful body. The new lizard does not respond. It is basking in the sun on a stump root. He displays once again, and the new lizard comes toward him and licks the bark a few inches from his front leg. Quickly he begins a series of very rapid up-and-down head nods before approaching what he now recognizes as a female tree lizard.

He will not chase this female out of the brush pile but will allow her to carry on her activities within his own range. They will breed, and eventually the female will lay several eggs. Later in the summer the male will cease his intense displaying and concentrate more on feeding.

This slightly anthropomorphic drama illustrates the characteristic behavior of lizards of the families *Iguanidae* and *Agamidae*. The *Iguanidae* include, of course, the iguana, but most members of the group are small and ordinary lizards like the American "chameleon" (*Anolis carolinensis*), the many spiny fence lizards found on rock walls and fence posts throughout the United States, and our tree lizard. Most of the iguanids live in Mexico, Central America, and the Antilles. All of them have a complex social behavior that includes displays of a more or less elaborate nature. At the new iguana exhibit opposite the main door of the Reptile House at NZP, male display behavior of this sort can be observed in a realistic setting.

The exact function of these displays is far from completely known. Many scientists are trying to describe all the different kinds of display and how they aid the lizards in spacing themselves out, finding members of the opposite sex, and recognizing members of the same species, and ensure that only the most viable animals reproduce themselves.

A great many of the lizards found in the deserts and grasslands of the American Southwest have such social relationships. The collared lizard (*Crotaphytus collaris*) pictured here is among the most beautiful and aggres-

sive of the iguanids that have been studied. These lizards inhabit rock piles where the males establish displaying sites and keep intruding males out of the area. Color plays an important role, apparently; and the males of the eastern race are bright emerald green with carrot-orange heads. If a model lizard of the proper shape and color is presented to a male collared lizard, he will rush up to it, display to it, and bump into it until he has knocked it over.

Dr. Charles Carpenter is one of the many workers actively studying the behavior of these lizards. Through many days in the field and in the laboratory he has discovered much of what we know about them. What we have learned so far is that these lizards lead very intricate lives. Because they are small and inconspicuous, few people except scientists have taken the time to observe their interesting habits.

A great many complex factors must be separated from one another before the significance of these lizard displays is known. It is still unknown, for instance, how they vary between one species and another or from one type of habitat to another. The exact function of display and its evolutionary history may never be clearly understood. How it is influenced by the experience of each individual lizard also remains to be discovered. And perhaps the most important thing to determine is exactly what tells a lizard that he is looking at one of his own kind and whether it is a male or a female. Moreover, why is it that when two males confront one another, one can usually be made to retreat by threat alone, and fighting is seldom necessary?

In the world around us, there are a great many other small and simple animals leading complex lives. The natural world is not made up of lions and antelope alone. Even tiny spiders lead lives fascinating enough to fill volumes. ■



Mammals That Build Houses

Harold J. Egoscue

Curator of the Division of Small
Mammals and Primates,
National Zoological Park

Housebuilding as an evolutionary trend is relatively rare in mammals. Many, of course, are known to retreat into caves, crevices, or other natural shelters or to construct burrows. Others regularly use the vacant or abandoned burrows of other animals. But only a tiny minority of less than half a dozen genera have species that can properly qualify as housebuilders. All of them are rodents, a highly successful order that has diversified in many directions.

The rodents that truly qualify as housebuilders include the beavers (*Castor*), muskrat (*Ondatra*), round-tailed muskrat (*Neofiber*), several species of wood rat (*Neotoma*), and the Australian sticknest rat (*Leporillus*). Accumulations of material put together by the rare red tree mouse (*Phenacomys longicaudus*) are usually considered nests, because of their small dimensions. Actually they probably represent houses, because much of the material used serves as a shelter for an actual nest; moreover, they also are permanent structures that may be occupied by successive generations of tree mice.

For all housebuilding species, the location and design of the house attempt to ensure the occupant a safe retreat from enemies. The well-known "lodge beavers" usually build their houses in ponds created by their dams, a prototype of the moat later constructed by man to protect his medieval castles. The very bulkiness of beaver houses, built of driftwood,

bushes, trees, and any other available material, discourages all but the most persistent predators. Lodges up to seven feet high and 30 feet in diameter, with enough room inside for a man, have been recorded. In the early days of the western United States, more than one trapper is said to have escaped from Indians by hiding in a beaver lodge. Muskrats living in marshes also build houses surrounded by water.

In parts of the arid southwest, wood rats use cactus for building material, which makes their houses virtually invulnerable to depredation by predators. Multiple entrances reduce the risk of surprise attacks by snakes and small carnivores. Red tree mice locate their shelters as high as 90 feet from the ground in hemlocks and other conifers.

The dusky-footed wood rat of California and Oregon builds houses up to six feet high and several feet in diameter, which may contain as much as 50 bushels of bushes, trees, twigs, and other handy materials. A house of this size, however, is not the work of one particularly ambitious rat, but rather, represents the cumulative efforts of many generations of occupants. In the Great Basin area, where the Humboldt River sinks into the sandy soil of Nevada and parts of Utah and south-east Oregon and California, favorite sites may be occupied continually for hundreds or even thousands of years. The lowest level of an ancient wood rat accumulation in southern Nevada contained material from a kind of conifer that no longer occurs there, the nearest present-day stand being more than 50 miles away. Carbon-14 dates of more than 10,000 years were obtained from the lowest level of debris. The history of continual occupancy of this place by wood rats rivals that of prehistoric man in certain archeological sites in the area. If each occupant lived in the house an average of 12 months, a total of more than 10,000 wood rats would have occupied the house from the time it was first built until it was taken apart by scientists a few years ago. The rats had apparently been able to adapt to climatic conditions that modified the vegetation. Perhaps the house made the difference between survival and extinction in this part of the animals' range.

The structures of all house-building mammals serve as home or refuge for innumerable species of invertebrates and vertebrates. Some

take short term leases, others are permanent residents and can be found in almost every house, sometimes using it simultaneously with the owner-builder. Skunks and mice, for instance, are fond of wood rat houses; geese nest on top of muskrat structures; and mink and otters may take up residence in vacant beaver lodges.

The houses built by mammals offer interesting possibilities for zoo exhibits. In such exhibits, the emphasis would be on what the animal does rather than what kind of animal it is. The only qualified housebuilder now living at the National Zoological Park, the beaver that shares its outdoor enclosure with the tapirs, turns out to be a bank-dweller. But given the opportunity to build a dam, the right material to work with, and a building permit, he might join in the zoo's master plan by becoming a lodge-building eager beaver. ■

The Caviomorphs

Unusual South American Rodents

Devra Kleiman, Ph.D.,
Research Associate,
National Zoological Park

Studies of rodents by ecologists, physiologists, ethologists, and geneticists have contributed greatly to our understanding of basic biological principles. But although rodents are by far the largest order of mammals, with nearly 1800 recognized species, the majority of scientists have used domestic mice, rats, hamsters, and guinea pigs for their research. Scientists have relied on these four types of rodents because they are easily maintained and bred in captivity, even though it is obvious that research on a wider range of species would provide a firmer basis for biological generalization.

Only recently have detailed studies been made of more unusual rodents. Among these, members of the suborder Caviomorpha have been found to exhibit particularly interesting behavioral and reproductive patterns that deserve further investigation. At present, the National Zoological Park is among the few institutions breeding and observing caviomorphs. Involved in the program are the rare Branick's giant rat or pacarana (*Dinomys branickii*), the acouchi (*Myoprocta pratti*), the degu (*Octodon degus*), the Cuban hutia (genus *Capromys*), and several other species.

The suborder Caviomorpha comprises ten families and is found only in the New World, especially Central and South America. Several



A month-old hutia (*Capromys pilorides*); native to the Cuban Isle of Pines, this species has evolved long claws for its arboreal life.

of the species are well-known. Guinea pigs (*Cavia porcellus*) are familiar as pets and laboratory animals; the chinchilla (*Chinchilla laniger*) is known for the commercial value of its fur; and the nutria or coypu (*Myocastor coypus*) has gained notoriety from the damage caused, particularly in Louisiana, by populations introduced into the United States. Other species are occasionally seen in zoos. The Patagonian cavy (*Dolichotis*) and the capybara (*Hydrochaerus*)—which is the world's largest rodent and may weigh well over 100 pounds—make attractive and interesting exhibits. Several species of another caviomorph genus, the agoutis (*Dasyprocta*), are currently on display at NZP.

As a group, the suborder has shown a remarkable ability to adapt to different habitats; thus, during their evolution, its members have developed a variety of forms. The more primitive species include the cavies (*Cavia*) of the pampas and savannah and the spiny rat (*Proechimys*), a forest dweller. Both are small, about the size of a guinea pig, and forage on the ground, occasionally using burrows or natural crevices for nesting. These two groups feed on whatever vegetation is available; the spiny rat adds fruit and nuts to this diet.

The more specialized members of the suborder have spread into such habitats as the rocky slopes of the Andes, desert scrub, marsh and



A newborn spiny rat (*Proechimys semispinosus*) unlike some other rodent young, is fully furred and its eyes are open.

swamp areas, the dense Amazonian forest, and the pampas region of South America. During the radiation of the suborder, these species have departed strikingly in body form from the primitive type. The forest-dwelling agoutis and pacas (*Cuniculus*), for example, have more terrestrial habits, as shown by their long slim legs; in this structural adaptation and in their reliance on camouflage or speed to avoid predators, they resemble the small forest ungulates of Asia such as the muntjac (*Muntiacus*) and the mouse-deer (*Tragulid*), which also forage on the forest floor. The still larger coypu and capybara have developed aquatic tendencies and are distinguished by their stout bodies and webbed feet.

The Patagonian cavy or mara is specialized for a plains or desert environment. With its long ears and legs, it resembles a hare and avoids predators mainly by speed. The tuco-tucos (*Ctenomys*) are burrowing rodents, creating complex underground burrow systems where

they are protected from predators. The numerous species of this genus are colonial, and individuals maintain a constant vigil at burrow entrances, giving an alarm call that warns their neighbors if a fox or other predator approaches. Like the pocket gophers (*Geomys*) of North America and other burrowing rodents, tuco-tucos have a small, stout body, short ears and legs, a reduced eye, and sturdy claws on the fore- and hind-feet for digging. Other species—the hutias, for example—are arboreal; the chinchillas and members of the octodont family, specialized for existence on the high rocky slopes of the Andes, are also good climbers and jumpers.

Despite this variety of body forms, there are certain reproductive and behavioral characteristics found in all caviomorphs that demonstrate their common ancestry. All species studied to date have relatively long gestation periods, and in most cases the litter is composed of a small number of well-developed



This adult male paca (*Cuniculus paca*) weighs nine-and-a-half pounds.

young that are able to follow the mother within a few hours of birth. Spiny rats and domestic guinea pigs, which have the shortest gestations, carry their young for 60 to 70 days, periods comparable to those of dogs and cats. Most caviomorphs, however, have gestation periods ranging from 90 to 150 days.

As a rule, the longer the gestation period of the species, the fewer the offspring produced. Thus pacas, viscachas, acouchis, and capybaras have only one to three young, whereas spiny rats and guinea pigs may average four or five. A litter of four or five is still small as rodent litters go, just as a gestation period of 60 to 70 days is relatively long. By contrast, rats and mice (family *Muridae*), with gestation periods that typically range from 18 to 30 days, usually produce 10 to 15 young in a litter. Moreover, whereas newborn rats and mice are blind and hairless, most caviomorph young are fully furred and have their eyes open at birth.

The tendency to produce a small number of well-developed offspring is most evident in those caviomorph species that are least dependent on burrows—the arboreal and terrestrial forms. Larger litters occur, not only among the more primitive species like the spiny rat, but also among those species that are specialized for a burrowing life. But even in the burrowing forms, such as the tuco-tuco, the litters are still relatively small.

Those caviomorphs that have few offspring often exhibit a prolonged mother-young bond; in other words, the mother and her litter may remain in contact long after the offspring are actually weaned. In fact, although young pacas, Patagonian caviés, and acouchis feed on solid foods when they are less than one week old, they may not actually separate from the mother until they are five to six months old. This is similar to the situation in ungulates and primates and is advantageous in that the young spend the critical juvenile period in the secur-

ity of the mother's company while learning about traditional food sources and about their own role in the social group.

Another intriguing aspect of caviomorph reproduction is the long interval between successive estrous periods. In the guinea pig, females come into heat about every 16 days; but in some of the more specialized forms, such as the chinchilla and the acouchi, there may be as many as 40 days between each heat period. Moreover, there is some evidence that the female caviomorph has a very restricted period of heat; she may be receptive for only three to six hours. Thus mating is only possible for a short time and at infrequent intervals. This presents certain problems for those species that are more or less solitary; the male must be forewarned of the female's approaching estrus through some system of communication. Presumably scent is of major importance. In several species there is a tendency to form pair bonds or to be colonial or gregarious, and this solves the problem, because the male and female are in relatively frequent contact with one another.

Caviomorphs are unique among rodents in several of their behavioral patterns, particularly in the area of communication. For example they have a large number of unusual vocalizations, and the early naturalists often commented on the peculiar alarm and contact calls of the different species. As described, the vocalizations include whistles, gurgles, growls, squeaks, grunts, and whinnies. Auditory communication in the caviomorphs is currently being studied at NZP in an endeavor to understand the functions of the different calls, and the variations in vocalizations within the suborder.

The caviomorph rodents also exhibit some unusual patterns of olfactory communication. All rodents have specialized glandular areas for depositing secretions or scent on objects in their environment, and the caviomorphs are no exception. This depositing of scent is thought to function either as a territorial signal to ward off intruders or as a sort of "security blanket" marking the individual's home range with his own scent.

The caviomorphs, however, have also developed a tendency to leave scent on others of the same species, usually in the form of urine. The pattern can be seen in both males and females. For example, a courting guinea pig

male will spray over a female by directing his rump toward her. In the degu, the movement is more specialized, and the male cocks his leg somewhat like a dog. The most specialized behavior pattern involving urination is seen in the acouchi, the Patagonian cavy, the agouti, and the paca.

In these species, the male rears up on his hind legs and achieves a full erection as he sprays urine on the female. Although urination on a member of the same species is seen throughout the suborder, there have not yet been sufficient studies to determine how the different behavior patterns have evolved and how they function within each species. In several forms, they are part of the male courtship ritual, but the females are usually defensive when they spray urine over males.

Caviomorphs communicate not only by means of scent and sound but also by means of movements or visual signals; one of the more intriguing communicatory movements also occurs during the male courtship ritual. As well as spraying urine, males may show shivering or trembling of the body and vigorous wagging of the tail as they follow or sniff the female. The male of a tailless species like the guinea pig may wag his entire rump, giving him a somewhat ludicrous appearance to human eyes. The effect on the female of all this trembling and wagging is not clear; but because it resembles the shivering seen in fearful individuals, it may communicate to the female the male's non-aggressive intentions and thus allow him easier access to her. ■

Why Scientists Avoid Anthropomorphism

Austin Hughes, Associate Editor

From time immemorial, human beings have been attributing human emotions, human characteristics, and even human vices to animals. The classic example of anthropomorphism was Benjamin Franklin's satirical statement opposing the adoption of the bald eagle as our national symbol: "He is a bird of bad moral character; he does not get his living honestly; you may have seen him perched on some dead tree, where, too lazy to fish for himself, he watches the labor of the fishing-hawk, and when that diligent bird has at length taken a fish and is bearing it to his nest for the support of his mate and young ones, the bald eagle pursues him and takes it away from him."

Today, few educated people would fail to see the humor of Ben Franklin's remarks—but there still is real danger that to characterize an animal as lazy, dishonest, or bad-tempered may lead some people to back up their moral judgments with guns. Gorillas, which, to naive Europeans, looked like stern and perpetually frowning men, acquired an undeserved reputation for ferocity and were needlessly persecuted. Some recent writers, decrying this history, have been at pains to assert that gorillas are "shy and retiring" or even "gentle." Neither are these characterizations correct. Gorillas know man as a dangerous enemy and do not deliberately pick fights with him. But if provoked or cornered, a 300- to 400-pound adult male gorilla can be a for-

midable adversary. Thus anthropomorphism can be deceiving and even dangerous.

True, scientists recognize that it is often convenient in informal discussions to call an animal shy simply to indicate that it is likely to retire if we approach it too closely, or to call another ferocious or bad-tempered to warn that its behavior is unpredictable and that it may attack suddenly. But they are quick to insist that there is no substitute for an adequate description of an animal's behavior patterns in explicit, nonhuman terms. Indeed, an anthropomorphic characterization is never needed for a complete understanding of the behavior of a nonhuman species.

Not that zoologists want to take the fun out of our viewing and reacting to animals in our peculiarly human and subjective ways. There is nothing wrong with the average zoo visitor's describing an animal as cute, endearing, or ugly—these are merely personal impressions. The problem may be that overemphasizing the appealing or unappealing aspects of animals may detract from our appreciating serious study and description. We may call a matamata turtle grotesque and forget to enquire the reasons for its bizarre appearance—its unusually long neck and the fleshy protuberances that cover it. We may forget, too, that all animals are worthy of our attention and respect, not only those that appeal to us personally. It would be tragic if we allowed

some species to become extinct simply because we subjectively find them undistinguished or ungainly.

Some conservationists have unintentionally increased this danger by centering attention on the more popular or glamorous endangered species. When do we hear about a Save-the-Hawaiian-Crow or Save-the-Asiatic-Wild-Ass campaign? And what about the lowliest creatures in the food-chain—among them the minute crustaceans and aquatic larvae that feed some of the great wading birds in Florida's Everglades? If man robs the glades of too much water, not only the small creatures would die. With them would go the wood stork, the white ibis, the roseate spoonbill, and many others.

The literal application of anthropomorphic attitudes would be active attempts to exterminate certain species whose appearance is unappealing to humans. This has happened in the past and continues to happen, although such animals usually also have a mistaken reputation as pests. The groundless fear many people have of all snakes, lizards, or bats illustrates such irrational and dangerous emotions.

However, our aesthetic responses are perfectly natural, and scientists share them. Indeed, many have been drawn to study nature through their appreciation of natural beauty. But they have learned to appreciate the beauty of its system and of its laws. From that point of view, even grotesque and commonplace animals are beautiful.

One other question deserves consideration. Should we hesitate to ascribe emotions to animals, such as anger, fear, or unhappiness?

Well, we are animals, too, and reactions analogous to human reactions certainly occur in other animals. When two male American anole lizards (often mistakenly called chameleons) prepare to fight, flattening their bodies, raising their crests, and displaying their crimson throat fans, it seems harmless to say they are angry. And among our closer animal relatives, we can find striking physical similarities between behaviors that seem to indicate certain emotions and human behavioral expressions of the same emotions. Yet we cannot take similarities for granted. Many observers have pointed out the striking similarities between human and chimpanzee facial expressions, but recently Jane Goodall has noted that the chimpanzee's "smile" expresses fear,

not pleasure. And in the case of the anoles, we not only would be hard put to find any precise parallelism between their external anger-behavior and our own, but we would also be seriously mistaken to conclude that the internal changes they undergo resemble even faintly the internal changes that accompany human anger, merely because we tend to label their fighting behavior as anger. The only similarities we can expect to find in all cases of anger-behavior is a rough similarity of cause—usually threat or attack—and of function—primarily to intimidate the aggressor.

In any given species, at least among higher animals, similar physical changes may accompany more than one emotion. In humans, for instance, both fear and anger lead to increased adrenalin. Nor does any one pattern of behavior always accompany any one emotion; rather, there is a whole repertory of possible responses, both instinctive and learned. Scientists are interested in the causes and functions of any given bit of behavior, not in the emotions the animal seems to be experiencing. Thus, to account for a gull's harsh cry and abrupt take-off, we say that the behavior is caused by the bird's having caught sight of a predator, and its function is to alert the rest of the colony. To say the gull called and took to the air "because it was afraid" adds nothing. Current scientific opinion holds that emotion words are never necessary to fully explain any animal behavior, even that of humans. ■

LECTURE REPORT

For more than two and a half years, Hugo van Lawick, a photographer and naturalist who specializes in African wild-life, intermittently followed and photographed a pack of wild dogs (*Lycaon pictus*)—members of the dog family belonging to a different genus than wolves and our domestic dogs—on the Serengeti Plains of Tanzania. At the Lisner Auditorium, on December 4, under the joint sponsorship of FONZ and the L.S.B. Leakey Foundation, van Lawick presented and gave a live commentary on the resulting film, entitled "Innocent Killers." One chapter in the book of the same name, written by himself and his wife, Jane van Lawick-Goodall, deals with an earlier phase in the lives of the same group of grassland carnivores, which van Lawick named the Genghis pack. (NZP has three of these striking-looking black, yellow, and white animals).

At the same session, Dr. Goodall presented and commented upon a film on chimpanzee behavior, "In the Shadow of Man." Her book of the same name is reviewed on pages 20 and 21 by Dr. Leonard Carmichael.

Van Lawick not only showed an excellent photographic record, but also offered a sound and fascinating scientific study of the behavior of these little-known wild dogs. The film begins when Havoc, as van Lawick named the dominant female in the pack, has first led a litter of young away from the den in which she bore and weaned them. They are still being fed, as their mother has been during nursing and weaning, by meat regurgitated by other members of the pack returning from their kills. All members of the dog family that have been studied have the remarkable ability to retain food undigested for up to at least six hours in order to regurgitate it for their young.

At this time, Havoc is beginning to show hostility toward Angel, another female. The rest of the pack follow suit, refusing to let Angel share in the kills. Angel is pregnant; and, when she chooses a den and bears her young, the pack neglect to feed her. When her young

are weaned, the hunters occasionally return to feed them but continue to refuse the mother, in spite of her submissive, pleading behavior.

Finally Havoc drives Angel from the den and begins to kill her young, one by one. Only one, Solo, is allowed to live. However, she is expected to travel with the pack, although she is much younger than two-and-a-half months, the age at which the young usually leave their den to share the pack's nomadic life. Moreover, she is small and weak for her age, because she has never been properly fed. Eventually van Lawick captured her and, with his wife, raised her in captivity until she was strong enough to return to the wild. The sequence in which the van Lawicks watch to see whether a wild female will accept the waif is as suspenseful and poignant as anything Hollywood could offer.

The film provides illuminating glimpses into the complex social order of the wild dog pack and their manner of raising their young. It includes rare and dramatic footage of zebra and warthog kills by the pack. Van Lawick's careful but colorful narrative is the equivalent of the field notes of a handful of articulate naturalists.

The book, "Innocent Killers," also includes a vivid introduction by Dr. Goodall, a chapter on golden jackals by van Lawick and one on spotted hyenas by Dr. Goodall. In the epilogue, unsigned, the authors declare their intention to observe the lives of some of the great cats, as well as continuing their work with wild dogs, golden jackals, spotted hyenas, and of course, chimpanzees. "Innocent Killers" and a limited number of copies of "In the Shadow of Man" are on sale at the gift shop at NZP at \$10 a copy. ■

BOOK REVIEW

IN THE SHADOW OF MAN—by Jane van Lawick-Goodall; Houghton Mifflin Company, Boston, 1971, 289 pages, Illustrations, \$10.

This is not just another animal book to help pass an idle hour. It is indeed as fascinating and exciting as any such book, but it is also a

modern, authoritative, scientific account of wild chimpanzees and of the animal social order in which they live. No postmistress of a small nineteenth-century Vermont town ever knew better the strengths and eccentricities of her fellow villagers than does the gifted author of this book know the personalities of her untamed chimpanzee friends on Gombe Stream in the deep-forested heart of Africa.

Dr. Jane van Lawick-Goodall, who tells us this surprising story of how our closest non-human cousins really live, is herself first of all a lover of animals. But her lover's eyes have a keen acuity because of her specialized knowledge of the new techniques and principles of ethology, the modern science of animal behavior, in which she recently took her Ph. D. degree at Cambridge University in England.

Some detective story writers help their readers by presenting a cast of characters early in their books. The end-pages of the present volume perform a similar service. Here are reproduced small pictures and a chronology of the appearance in the book of David Graybeard, Goliath, Flo, Olly, and all their chimpanzee friends and children. In chapter after chapter, the reader comes to know in a warm and intimate way what may be called the whole *dramatis chimpanzeeae* of the Gombe Stream Reserve, in Tanzania.

The book is pleasantly informal. In it, we see how Jane as a little English girl came to be so deeply interested in animals. We learn how her field studies began and of the ways in which she gradually made peculiarly her own a small chimpanzee-frequented territory on the shores of Lake Tanganyika, which is one of the longest lakes of Africa. She describes life in her base research camp and tells of how, month after month, she gradually built up an intimate relationship with what are now her close and trusted chimpanzee friends. Sensitive details are given about interesting families and the behavioral characteristics of chimpanzee infants, children, and adolescents.

Friends of the National Zoo may be especially interested to know that the epoch-making primate research that is described in the book was made possible by our own Washington-based National Geographic Society, which has provided funds each year in the past decade for this study.

Alexander Pope well said that the proper

study of mankind is man. In the pages of the present book, we see in a new way that another approach for one who would really understand man's behavior is to see how our great and surprisingly wise wild chimpanzee relatives live and order their lives. They maintain themselves in no word-engendered social order and are innocent of the use of the theories and abstractions that often confuse as well as advance the way in which we live together. We have long called our own species *homo sapiens*, that is, *man the wise animal*. But as we read this book, the haunting suspicion grows that this name we have taken is a little presumptuous. Chimpanzees also have a deep primate wisdom and some things that they do might even deserve emulation by us, their less hairy cousins. ■

Leonard Carmichael
Vice President for Research & Exploration
National Geographic Society

ZOOS—by John Perry; Franklin Watts, Inc., New York, 1971. Illustrations, 86 pages, \$3.75.

John Perry, assistant director of the National Zoological Park, says that all zoos have the same need to provide the best possible care for their animals. In this latest book, written for children, he describes the people, equipment, and procedures necessary to achieve that goal.

The reader is told how the commissary functions, how the keepers tend their animals, and how the veterinarian recognizes and treats sick animals. He learns why the bars on the bear cages curve back and down at the top, why there is a mud-hole in the rhino's yard, and why the Latin names for all animals are given on the identifying signs. He is alerted to look for many things at the zoo that probably went unnoticed before he read this book. His next visit to the zoo will certainly be more interesting and exciting.

Mr. Perry's book is simple enough for the fourth- or fifth-grade child but is by no means limited to that age group. It is written in short factual sentences. The author is never patronizing. The book is well illustrated with photographs and has a good index.

Copies of *Zoos* may be purchased at the FONZ gift shop. ■

Shirley McNair
FONZ Board of Directors

NEVER CRY WOLF—by Farley Mowat; Dell - Laurel Edition, New York, paperback 1965, 175 pages, 50 cents.

"Never Cry Wolf" is by no means a new book. When it was first published in 1963, Farley Mowat's tale of wolves in the Canadian wilderness was well received by the critics and largely ignored by laymen. Recently, however, the paperback edition has attained such popularity that it is being displayed beside "The Godfather" and "Love Story" in bookstores.

Mowat was hired in the early 1950s by the Canadian government to gather data pertaining to Canada's "wolf problem," and proceeded to set up a field laboratory in the midst of the vast Keewatin Barrens in the Northwest Territories west of the Hudson Bay. Fortunately for his study, a wolf family maintained quarters nearby, and though Mowat left the area briefly to sample surrounding wolf populations, the bulk of his study concerns this family.

The family consists of George, the patriarch; his mate, Angeline, to whom the book is dedicated; their four unnamed cubs; and Uncle Albert, an unattached male who serves as babysitter, hunting companion, and perhaps deciding voice in family disputes. Mowat moved a tent to a spot near the den with a good vantage point for observation. His reaction to the wolves changed from initial fear to neighborly respect, and he describes their comings and goings with warmth, understated admiration, with and considerable wit.

Of especial interest is Mowat's discovery of the general good nature of the wolves, exemplified by their acceptance of him, their overly inquisitive neighbor. After several weeks, Mowat mimicked the territorial marking methods of the wolves by urinating on the perimeter of an area surrounding his tent, including a portion of the path the wolves used for nightly hunting expeditions. The wolves' reaction, after apparent initial surprise, was to respect the markings by never again entering the area while Mowat lived there.

As for the charge of the Canadian government that the wolves were dangerously thinning the caribou population, Mowat found that their primary food source was field mice. On the few occasions that the wolves did hunt caribou, they sought only the unfit individuals.

He learned that in fact it was human hunters who were slaughtering the deer.■

Katie Kazan

FONZ NEWS

FONZ Board Appoints Executive Director

Warren J. Iliff, until recently special assistant to Dr. Theodore H. Reed, the director of the National Zoological Park, became the executive director of the Friends of the National Zoo on January 9, 1972.

Mr. Iliff, who graduated from Harvard College in 1958 with a major in political science, has worked at NZP since 1967. His varied duties included administering the animal purchase funds; arranging NZP special events from small dinners to a cocktail party in the Elephant House for 700 guests; and conducting zoo tours for various foreign and local dignitaries and for special large groups. He also prepared reports for the Secretary of the Smithsonian Institution, developed grant proposals, and directed the pilot keeper-training project, staffed by two zoological instructors. He has recently visited other zoos to describe the training and recruiting projects he helped develop at NZP.

Throughout his four-year tenure at NZP, Mr. Iliff has worked closely with FONZ, coordinating and assisting the association with its lectures, special events, and meetings and has helped train nearly 100 FONZ guides. Prior to joining the staff of NZP, Mr. Iliff was himself a member of FONZ and served for a year as a board member.

He first became interested in zoos during a three-year tour in eastern Honduras as a helicopter pilot, crop-dusting bananas for the United Fruit Company. Here he first came into close contact with various kinds of wildlife. In his spare time, he hand-reared coatis, jaguarondis, monkeys, agoutis, and parrots. He even designed a zoo and built a scale-model for the city fathers of San Pedro Sula. Shortly after that endeavor, he left the country; and although his zoo was never developed, Mr. Iliff had found his own professional identity as a zoo man.■

EDITORIAL

A Tribute to Richard Sheridan

I cannot begin my tenure as Executive Director of the Friends of the National Zoo without first paying a heartfelt tribute to my immediate predecessor, Mr. Richard Sheridan. One day last summer, he was virtually hijacked from a plane, on which he was going to Chicago to discuss a European fellowship in history, to become the temporary Executive Secretary of FONZ. Since that day, he has gained the respect and friendship of both NZP and FONZ staff members.

With tremendous zeal and high enthusiasm, Rick accomplished a great deal in the very few months that he filled the leadership gap suffered by the association. He supervised the production of the summer and fall issues of *Spots and Stripes* and, perhaps his most visible contribution, helped to bring about the change in the magazine's format, which is demonstrated by this first "new" issue.

He discovered Laura Kent, a FONZ member who is a skillful professional writer, and arranged for her to work with Austin Hughes, the associate editor of *Spots and Stripes*, to develop an outline of and do the research for a guidebook to the Zoo. He made plans for "zoo-faris"—trips by FONZ members to other zoos; and, with the help of the curators, began to develop educational programs for the younger members of FONZ. He and his staff also kept the other FONZ membership services afloat.

That he did so much in so short a time is the more amazing when we realize that he had no previous background in the zoo field. We wish Rick well and hope that he has caught the zoo virus so severely that we can count on seeing him professionally as well as personally in the future. ■

Warren J. Iliff,
Executive Director.

Friends of the National Zoo is a nonprofit organization of citizens interested in furthering the objectives of the National Zoological Park. Its programs are approved and carried out with the cooperation of NZP.

As a member of FONZ, you are entitled to receive *Spots and Stripes*, published quarterly; to participate in the annual gala Zoo Night; to serve actively in FONZ volunteer programs; to receive a ten percent discount at the FONZ gift shop; and to share in other services FONZ operates for NZP.

There are many volunteer activities, one of the most active being the FONZ guide program. Last year, trained FONZ guides took nearly

18,000 school-children through NZP. Members of the preg-watch committee help NZP by monitoring pregnant animals via closed-circuit television and causing professional people to be summoned when a birth occurs or appears imminent.

Other volunteers work in the gift-shop, help produce and mail *Spots and Stripes*, and assist at FONZ lectures and other public activities. Volunteer programs now in the planning stage include educational programs for young people in various aspects of the natural world.

See page 4, Lecture Announcement, for a special offer of free lecture tickets to new members.

FRIENDS OF THE NATIONAL ZOO
c/o National Zoological Park
Washington, D.C. 20009



Friends of the National Zoo Membership Application

I wish to become a member of FONZ in the category
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Life Membership involves a one-time payment of \$250. Corporate, Group, or Patron is \$100 a year; Sponsoring members pay \$50; Contributing \$35; Family \$15; Individuals, \$7.50; and bona fide college or high-school students \$3.

Check One

- Life Member ☐
- Corporate, Group, or Patron ☐
- Sponsoring ☐
- Contributing ☐
- Family ☐
- Individual ☐
- Student ☐

I enclose \$ for a gift membership for the person named on the left. Please send a gift card signed:

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New name _____ My name _____
